The basic principles of molecule arrangements in ordinary ice were stated over 40 years ago by Bernal and Fowler. Most important was the formation at each molecule of a tetrahedral pattern of hydrogen bonds to four nearest neighbors; furthermore, the separate nonlinear molecules remain intact. Pauling amplified this idea in 1935 by pointing out that these "ice rules" still permitted substantial freedom in the orientation of molecules within the tetrahedral network. With suitable modifications, these structural manifestations of water-molecule interactions persist through all the various ice polymorphs and hydrate crystals. That is hardly surprising, since precisely the same intermolecular forces operate in all thermodynamically distinct phases containing water. For the same reason, study of the ices will also inevitably aid in the important task of understanding liquid water and aqueous solutions.

Occasional violations of the Bernal-Fowler-Pauling ice rules give rise to point defects, including vacancies and interstitials, Bjerrum orientational defects, and ionized molecules. These control most kinetic properties for single crystals, such as electrical conduction, dielectric and nuclear magnetic relaxation, sound absorption, and self-diffusion. Distinguishing the separate contributions made by the motion of the various defect types has become clearly desirable, and several papers in this symposium illustrate the effort that is being devoted to that task. General optimism that the contributions will eventually be separated has sprung from the view of ice as a "protonic semiconductor" subject to controlled doping; however, one of the papers in this collection pointedly questions the validity of proton semiconduction. In any event, from reading this book it is clear that precise and controlled experiments with clean interpretations are difficult and that the few available procedures that approach those ideals can be improved.

While the problems of point defects in perfect crystals are themselves challenging, a far broader technical scope is forced on researchers in this field by the demands of meteorology, oceanography, glaciology, and even astronomy. This has led to inclusion in this book of papers devoted to dislocations and plastic flow, properties of nucleation clusters, crystal surface topography, and growth mechanisms. The general impression conveyed is that considerable expansion of fundamental knowledge bearing on each of these topics should be encouraged.

Over 60 technical articles appear in this volume. Together with the recorded discussion remarks, they seem to convey a comprehensive view of the status of the field in 1972. The collection offers an implicit invitation and provides a means for qualified outsiders to consider making their own contributions to this interesting subject. Such a prospect is made all the more alluring by tight editing (which has all but eliminated typographical errors) and the attractive appearance of the text. In addition, the editors offer extra deft and graceful touches, including an opening essay on ice as an evocative image in literature and a closing poem entitled "The Ices."

An earlier international symposium on ice was held in Munich in 1968. Surely others will follow. We shall be fortunate if their proceedings are as comprehensive and are reported as effectively as those in Ottawa.

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